

Marshmallow

Althaea officinalis

AN OVERVIEW OF ITS BIOLOGICAL ACTIVITIES AND MECHANISM OF ACTIONS

Scientific report
authored by





With Marshmallow (*Althaea officinalis*), a member of the Malvaceae family, has been used for centuries across Europe, India, and Russia **to maintain healthy cough and respiratory tract**. Teas and syrups containing marshmallow were widely used for soothing dry throats and traditionally used for symptomatic treatment of oral or pharyngeal irritation associated with dry cough. The original composition of the plant **containing mucilage, polysaccharides (including rhamnogalacturonans), partly explains its efficacy**.

Physiology and management of cough

Cough is among the **most prevalent medical complaints**, responsible for approximately 30 million clinical visits annually. It is an innate, primitive reflex that can occur reflexively or voluntarily in response to a foreign material or infection [1, 2]. Cough may also be a side effect of drugs like anti-hypertensives or in response to endogenous stimuli generated during gastric reflux. The physiological pathways involved in coughing reflex have been extensively studied. Cough is triggered by the **activation of the vagal sensory neurons** innervate the airway epithelium, which detect and respond to respiratory stimuli, including irritants, pathogens, and inflammatory mediators (Figure 1). In the case of pathogens, the molecules that they encode (toxins, lipids, and proteins) can directly interact with cough-transducing receptors and activate cough. Depending on the pathogens involving cough, a **dry or productive cough can develop with a management that is different** [1, 2]. Generally, for an irritative or chronic cough the objective is to be suppressed, while a productive cough, which aids in clearing the respiratory tract of irritants or excess mucus, the cough should not be suppressed but less stimulated. Treatments of cough vary depending on the underlying cause, but it generally includes:

- Drugs: antibiotics (if bacterial infection), inhaled bronchodilators (for asthma or chronic pulmonary disease – COPD), corticosteroids (to reduce inflammation);
- Over-the-counter medications: antitussives for dry cough, or expectorants for productive cough.

Those pharmacological approaches **target mainly the suppression of the cough arc-reflex**.

Plant extracts could also be used to support the throat, and one of the common plants for irritative cough is marshmallow. Those may support multiple factors involved in the activation of the cough reflex during viral infection (e.g. irritation, hypersensitivity, reflux...) [3].



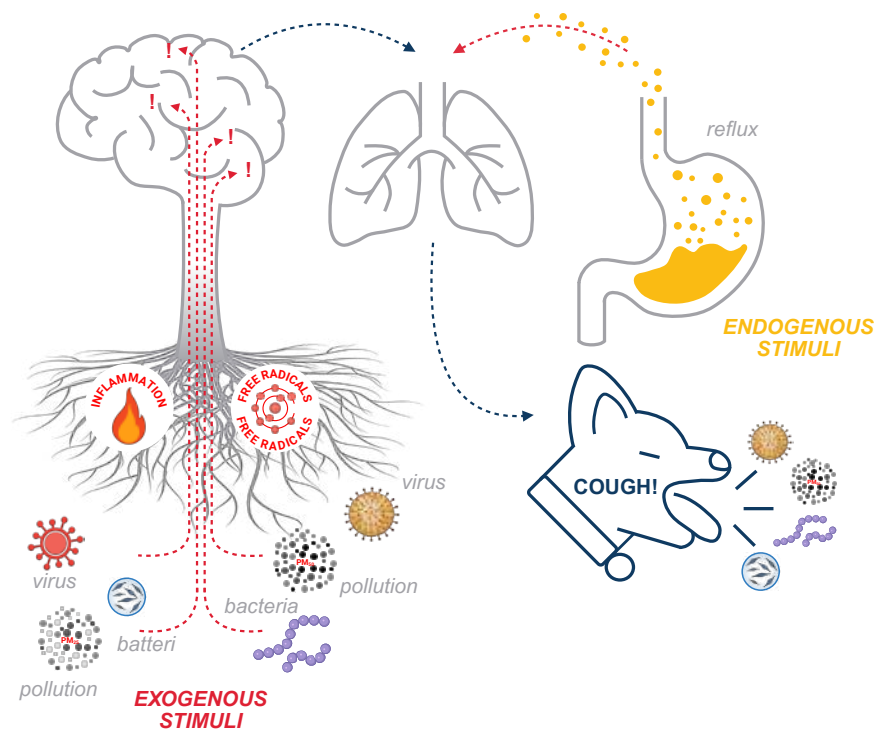


Figure 1. The cough - “the watchdog of the airways” (Pecoraro et al., 2024)

Marshmallow (*Althaea officinalis*)

Marshmallow is a perennial herb belonging to the *Malvaceae* family. Marshmallow has been used from centuries, from Europe to India, to **relieve inflammation and cough**. The beneficial effects of Marshmallow root have been linked to its **richness of mucilage polysaccharides** (mainly arabinogalactans), **pectin and polyphenols**. They make this herb an excellent demulcent, emollient, and anti-inflammatory agent [4-6].

Biological activities of Marshmallow

Marshmallow has been used traditionally to relieve cough, irritation and inflammation as reported in several monographies [4, 7, 8].

The scientific literature confirmed those traditional used. In preclinical studies, using several animal models, the use of marshmallow extracts from different parts of the plant (roots or aerial parts)

demonstrated the **antitussive activity in unanesthetized** animals and in most cases with an effect higher than the activity of reference non-narcotic-drugs [6, 9-11]. Marshmallow demonstrated the **highest cough-inhibiting effect** when compared to the other plant extract, i.e burdock and peach gum polysaccharides [12].

Clinical studies support also the efficacy of marshmallow in a context of infection or drug-induced cough. In a **double-blind clinical study**, the use of *Althaea officinalis* in subjects with hypertension who had developed a cough while taking angiotensin-converting enzyme inhibitors was investigated. The subjects received 40 mg of *Althaea officinalis* three times daily for four weeks. The mean severity scores of the cough in the group treated with *Althaea officinalis* showed a significant reduction from 2.66 \pm 0.958 to 1.23 \pm 1.006. Eight patients in the *Althaea officinalis* group **experienced almost complete resolution of the cough**. Another study evaluated **two non-interventional surveys** conducted to evaluate the effectiveness and tolerability of a water marshmallow root extract for treating irritative dry cough [13]. The survey was done on two different galenic forms: lozenges and syrup. A total of 822 consumers were recruited in German pharmacies during two different winter seasons. In the surveys testing the lozenges, the participants rated symptom severity daily on a scale whereas for the syrup survey, the participants rated symptom severity at baseline and improvement over 7 days using the same scale. Both forms of the marshmallow extract provided **rapid and significant relief from dry cough** and associated symptoms, such as throat irritation and dryness with a median recovery time of 5 days. For the lozenge forms many users experienced relief within 10 minutes of intake. High satisfaction levels were reported for both lozenges and syrup, with users noting the quick onset of symptom relief and excellent tolerability. The surveys confirm the **effectiveness and safety of** marshmallow root extract in treating irritative dry cough. The plant was well-tolerated and provided rapid symptom relief, supporting its use as a reliable option to relieve dry cough [13].

Several **preclinical studies** were performed in order to explain the efficacy of marshmallow root and also to identify the potential molecules responsible for such an effect.

Mechanism of actions

Marshmallow root contains several molecules with specific properties that can support its **antitussive effect** but also its **soothing and emollient properties**.

One of the molecules involved is **rhamnogalacturonan**, which has been tested independently from the whole plant in preclinical models to identify the **receptors it can bind to**. Among these receptors, **serotonin** and its receptor, known for their role in mood regulation, also appear to be involved in the physiology of cough. Serotonin (5-hydroxytryptamine- 5-HT) is synthesized by pulmonary neuroendocrine cells within the airway mucosa and is released in response to variations in the gaseous composition of the **airway lumen**. The defense reflexes of the airways are known to be associated with the function of 5-HT₁₋₃ receptors. Particularly, the peripheral components of airway reflex arcs are closely linked to the 5-HT₂ receptor, which is extensively distributed on airway smooth muscle and sensory nerves. Experimental results indicated that ketanserin, a selective 5-HT₂ receptor antagonist, partially reduced the suppressive effect of rhamnogalacturonan in citric acid-induced cough reflex in guinea pigs when used as a pretreatment. This suggests that **5-HT₂ receptors may play a role in the cough-suppressive activity of Althaea polysaccharides**. Moreover, the highest dose of rhamnogalacturonan tested exhibited an antitussive effect comparable to that of orally administered central antitussive codeine.

Dry and irritative cough modify the oral epithelium. It has been reported that low molecular weight compounds, including unique flavonoid-O-sulfoglycosides, can inhibit human hyaluronidase-1 (HYAL-1) an enzyme capable of breaking down **hyaluronic acid**, a component crucial for maintaining tissue hydration and integrity. The extract's mucilaginous polysaccharides form a **protective layer on inflamed** epithelial

tissues, which supports wound healing and reduces irritation. This **dual mechanism — bioadhesive protection and enzyme inhibition** —underpins the therapeutic potential of marshmallow root in treating conditions like dry cough and mucosal irritations [14]. Other mechanism of action of the plant has been described to explain the positive effects of marshmallow root extract, notably its impact on inflammation and oxidative stress. In in vitro studies demonstrated that marshmallow can **significantly reduce IL-6 release of LPS-activated cells** and also **reactive oxygen species** (ROS) production when cells are treated with the plant extract before the application of an oxidative stress generator, H₂O₂ [15].

Conclusion

Marshmallow (*Althaea officinalis*) root extract is naturally composed of **mucilage polysaccharides** (including rhamnogalacturonans), **pectin** and **polyphenols** traditionally known to helps for **symptomatic treatment of oral or pharyngeal irritation** associated with **dry cough**. The beneficial throat effect of marshmallow root extract seems to be linked to its **anti-inflammatory and antioxidant** activity and in its capacity to inhibit hyaluronidase, an enzyme that reduces tissue integrity. The anti-tussive properties seem to be linked to **mucilage** that help to reduce the frequency, intensity and number of cough effort. This property can be explained by its capacity to form a bioadhesive layer on mucous membranes, acting as a **protective film**, that **prevents stimulation by pathogens**. In addition, rhamnogalacturonan polysaccharides have the property to inhibit cough reflex via serotonergic 5-HT₂ receptor. Based on scientific literature, marshmallow root extract can be a **good choice to cope with sore throat and irritative cough**.



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References

1. Footitt, J. and S.L. Johnston, Cough and viruses in airways disease: mechanisms. *Pulm Pharmacol Ther*, 2009. 22(2): p. 108-13.
2. Jacoby, D.B., Pathophysiology of airway viral infections. *Pulm Pharmacol Ther*, 2004. 17(6): p. 333-6.
3. Pecoraro, L., et al., Well-Established and Traditional Use of Vegetal Extracts as an Approach to the "Deep Roots" of Cough. *Children (Basel)*, 2024. 11(5).
4. (EMA), E.M.A., Assessment report on *Althaea officinalis* L., radix. 2016.
5. (EMA), E.M.A., European Union herbal monograph on *Althaea officinalis* L., radix. 2016.
6. Mahboubi, M., Marsh mallow (*Althaea officinalis* L.) and its potency in the treatment of cough. *Complementary medicine research*, 2020. 27(3): p. 174-183.
7. (WHO), W.H.O., WHO monographs on selected medicinal plants. 2002. 2.
8. E, C., *Althaeae radix* (marshmallow root). 1989.
9. Nosáľvá, G., et al., Antitussive activity of a rhamnogalacturonan isolated from the roots of *Althaea officinalis* L., var. *Robusta*. *Journal of carbohydrate chemistry*, 1993. 12(4-5): p. 589-596.
10. Sutovska, M., et al., Antitussive activity of *Althaea officinalis* L. polysaccharide rhamnogalacturonan and its changes in guinea pigs with ovalbumine-induced airways inflammation. *Bratislavské lekárske listy*, 2011. 112(12): p. 670-675.
11. Sutovska, M., et al., Possible mechanisms of dose-dependent cough suppressive effect of *Althaea officinalis* rhamnogalacturonan in guinea pigs test system. *Int J Biol Macromol*, 2009. 45(1): p. 27-32.
12. Sutovska, M., et al., Antitussive activity of *Althaea officinalis* L. polysaccharide rhamnogalacturonan and its changes in guinea pigs with ovalbumine-induced airways inflammation. *Bratisl Lek Listy*, 2011. 112(12): p. 670-5.
13. Fink, C., M. Schmidt, and K. Kraft, Marshmallow Root Extract for the Treatment of Irritative Cough: Two Surveys on Users' View on Effectiveness and Tolerability. *Complement Med Res*, 2018. 25(5): p. 299-305.
14. Sendker, J., et al., Phytochemical Characterization of Low Molecular Weight Constituents from Marshmallow Roots (*Althaea officinalis*) and Inhibiting Effects of the Aqueous Extract on Human Hyaluronidase-1. *J Nat Prod*, 2017. 80(2): p. 290-297.
15. Bonaterra, G.A., et al., Phytostil((R)) and root extract of *Althaea officinalis* L. exert anti-inflammatory and anti-oxidative properties and improve the migratory capacity of endothelial cells in vitro. *Front Pharmacol*, 2022. 13: p. 948248.

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